



# SWIT

Swirling Induction Type HVAC System



Takasago Thermal Engineering Co., Ltd.

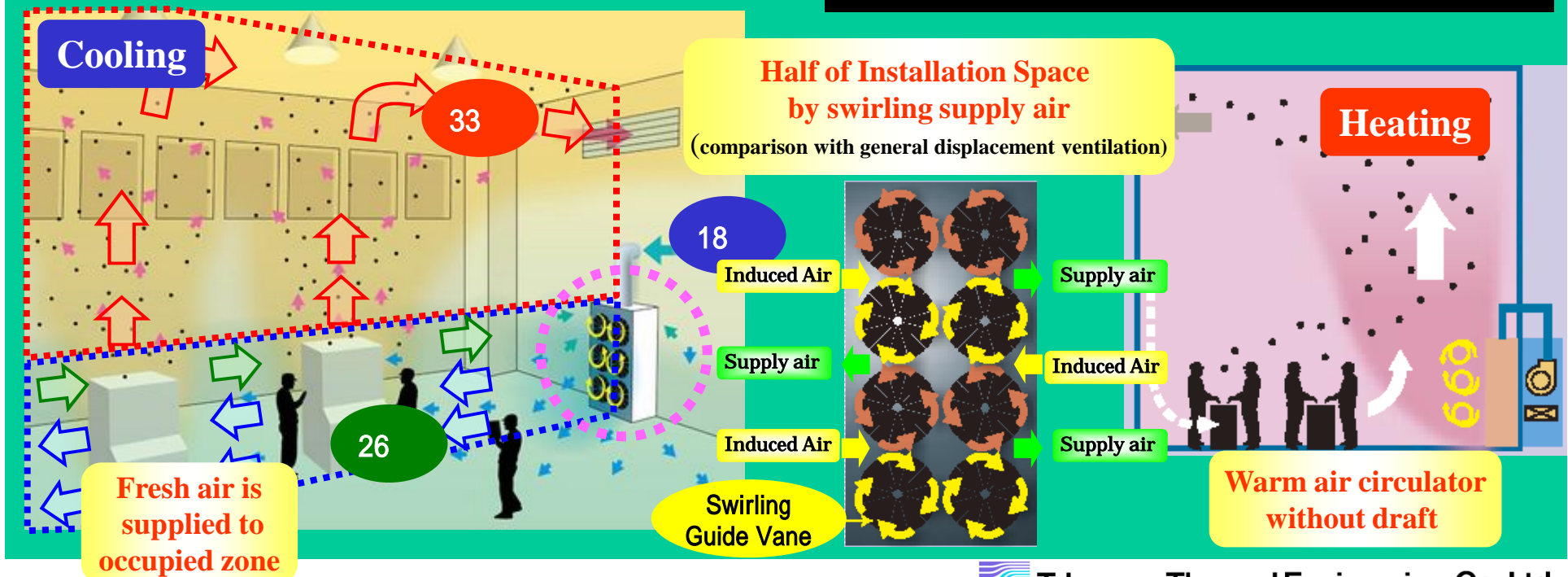
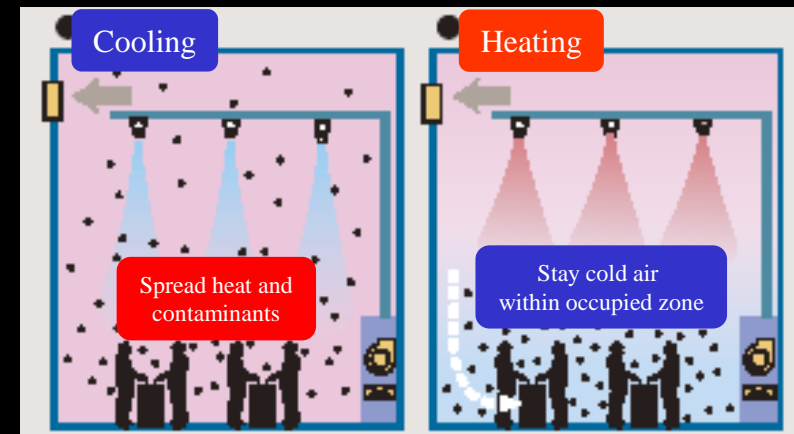
## New HVAC system for the large-scale enclosure

# Merits of the SWIT

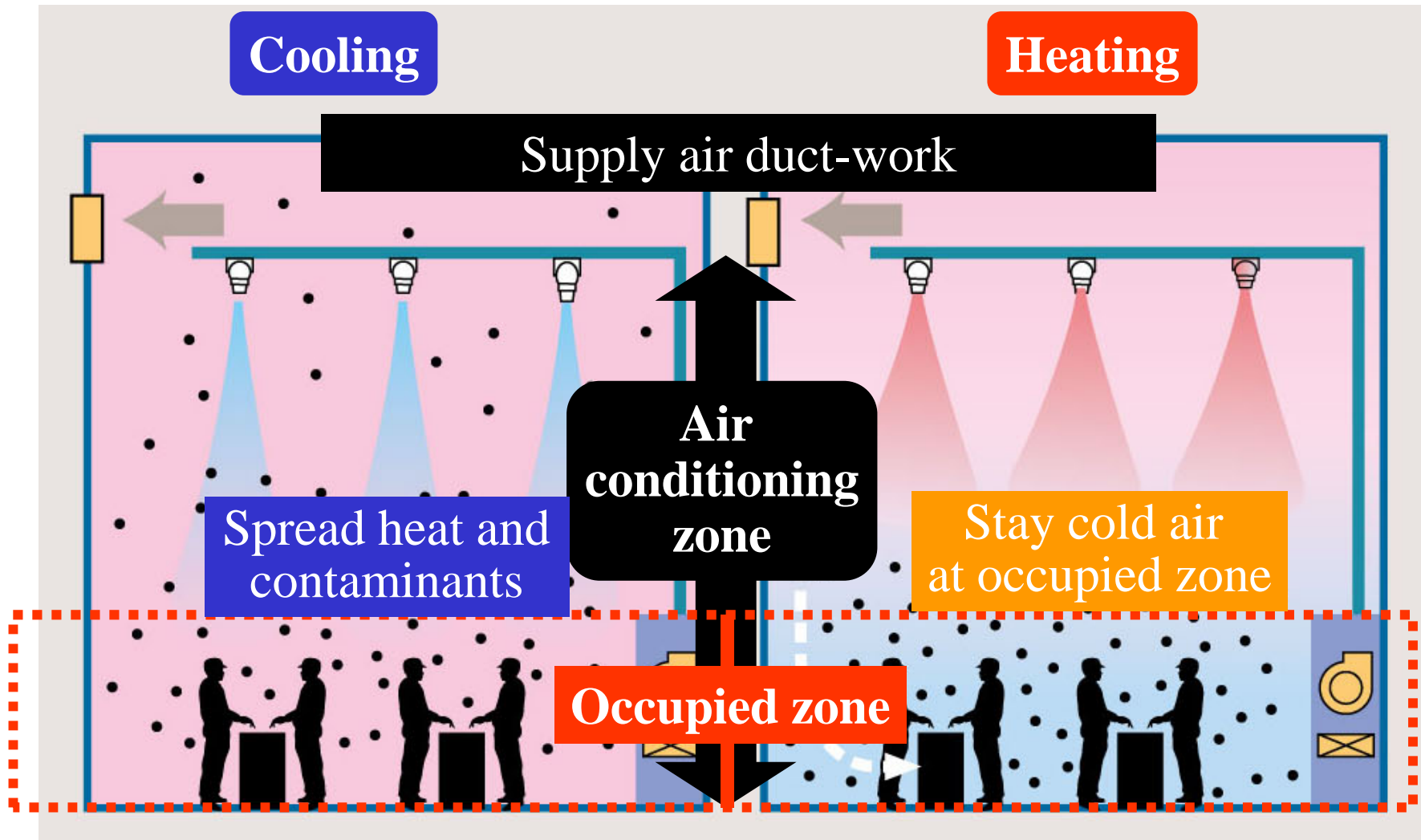
### Merits

Comfort and Clean Environment  
Flexibility and Reduction of  
Installation Space  
Reduction of Installation Cost  
and Energy Consumption

### Mixing System

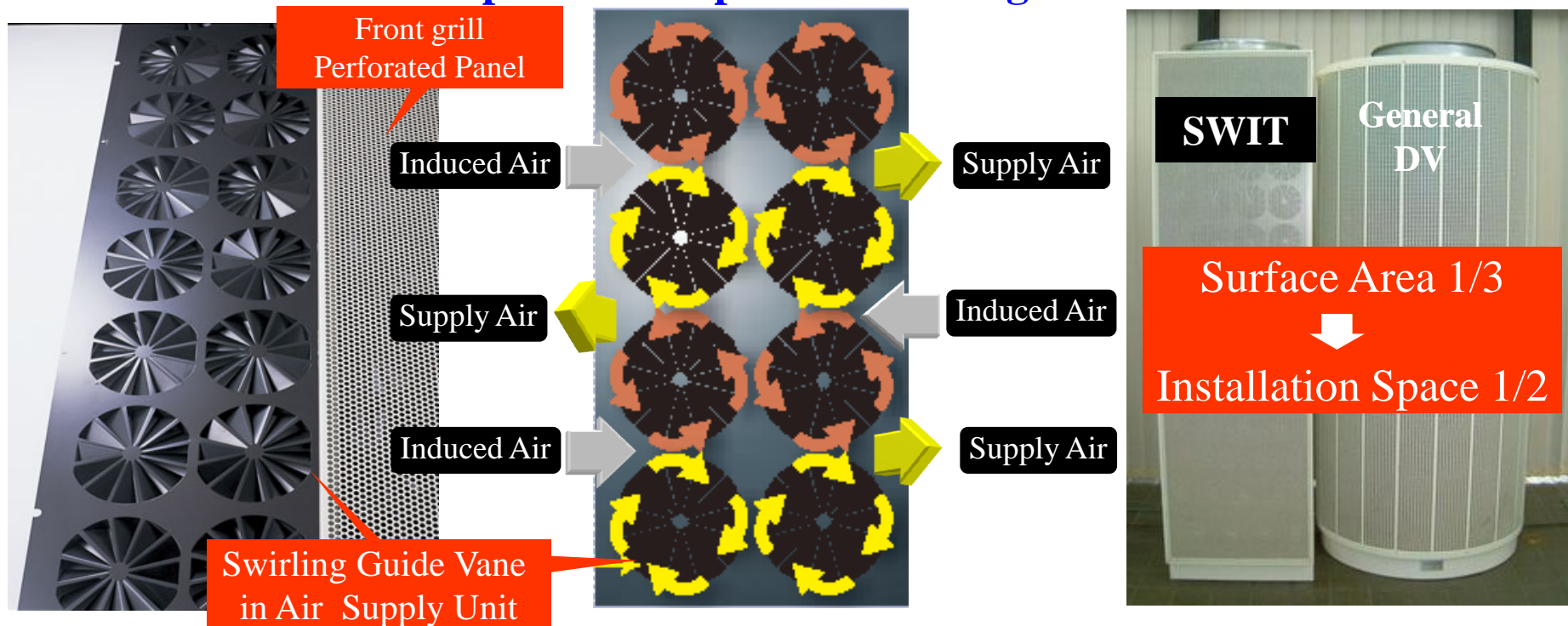


# Air Movement of Mixing System

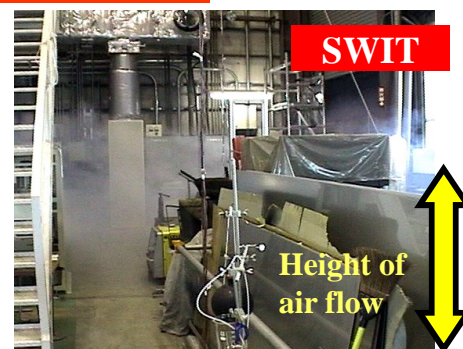


## Merit of the SWIT Reduction of Installation Space

Using combination swirling air flow, the amount of induced air is increased near the air supply unit for the SWIT. The air supply unit for the SWIT is compact and half of installation space as compared with the general DV.



By the induction effect, the SWIT can move the air within occupied zone slowly.



At the DV system, the supply air flow is moved only near the floor.

# Merit of the SWIT Comfort and Reduction of Energy Consumption

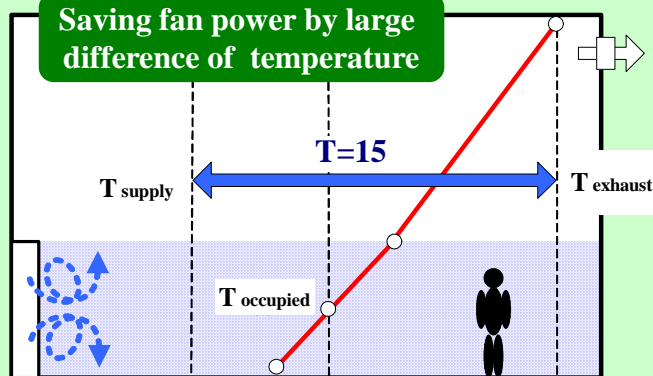
## SWIT

It is not necessary  
too cooling  
supply air .

Saving heat source  
energy because of  
high temperature  
of supply air

### Cooling

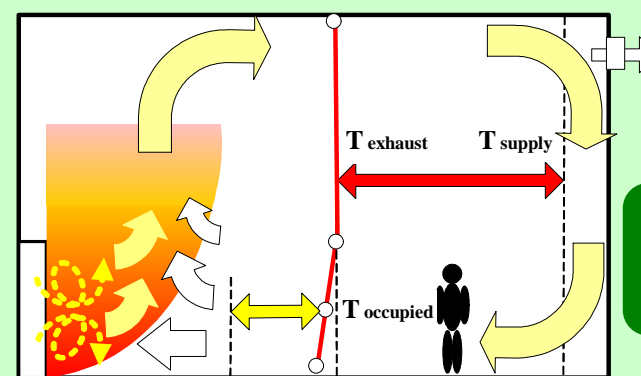
Saving fan power by large  
difference of temperature



Low Temp.

High Temp.

### Heating

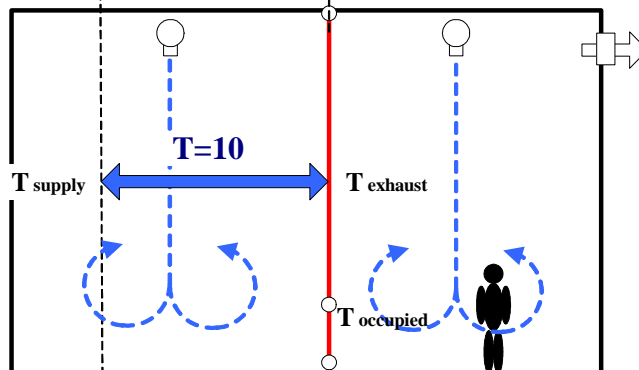


Warm air  
circulator  
without draft

Low Temp.

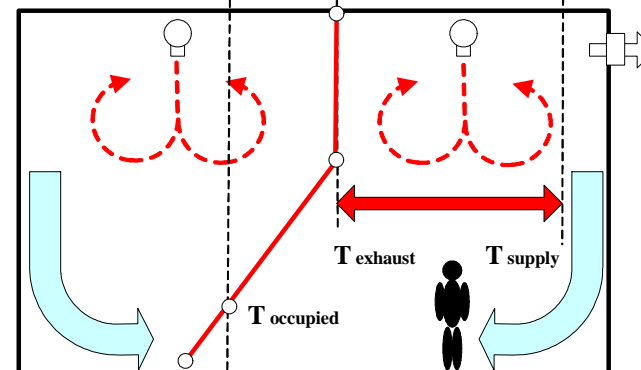
High Temp.

## Mixing System



### Cooling by Mixing System

It is so ineffective that the higher area in which a person is not present is air-conditioned. Heat and contaminants are spread toward occupied zone



### Heating by Mixing System

Since warm air does not arrive to occupied zone , colder air stay within occupied zone. Since air at occupied zone does not move, most contaminants can't be diluted.



## Merit of SWIT

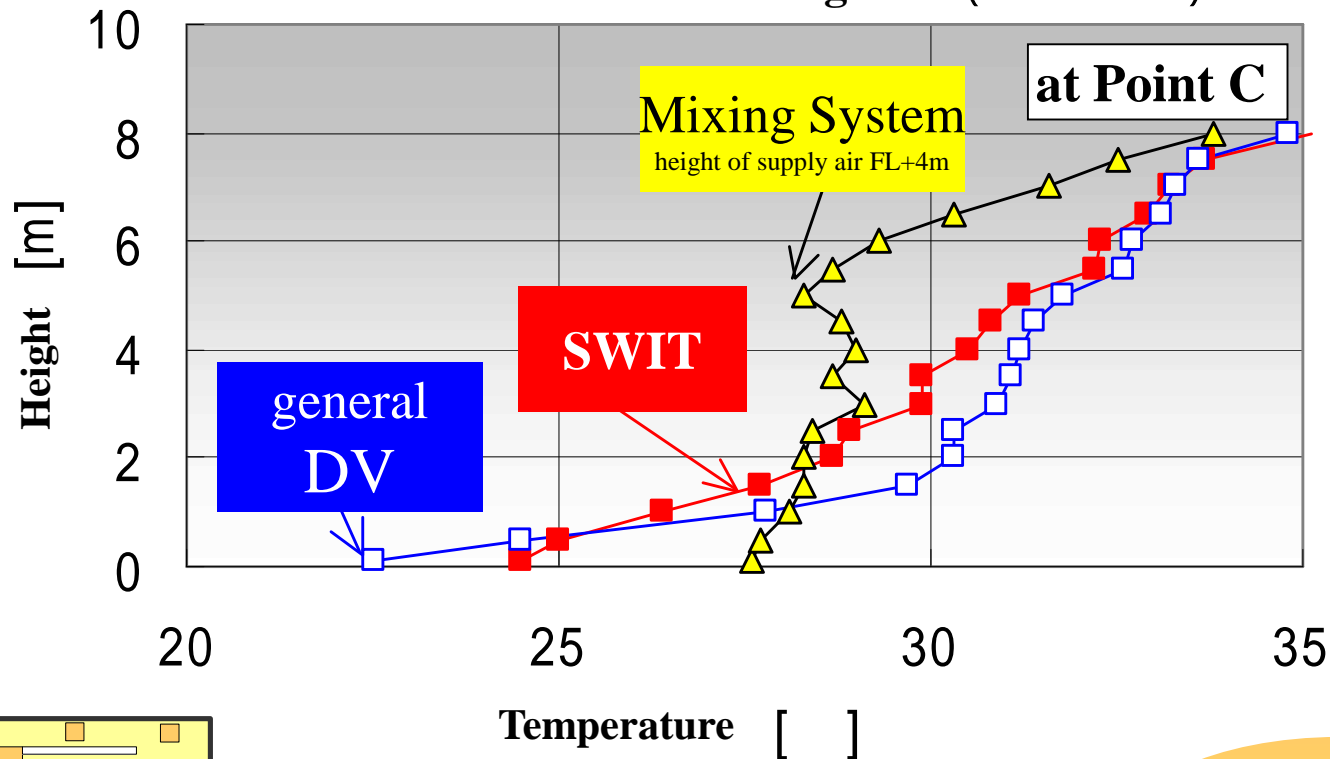
# Vertical Profile of Temperature at Cooling

It verified that SWIT was most comfortable than other systems by field Measurement

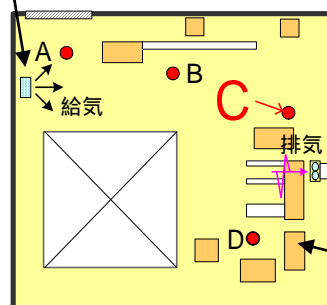
comparison in same conditions: supply air temperature (18 °C)

supply air volume (21 m<sup>3</sup>/h/m<sup>2</sup>)

cooling load (120 W/m<sup>2</sup>)



Supply Air



Exhaust Air  
(FL+9m)

Machine tool  
(In Operation)

Machine work building : 200m<sup>2</sup> × 10m<sup>H</sup>

Cooling Load  
120W/m<sup>2</sup>

Outdoor Air Temperature 30°C

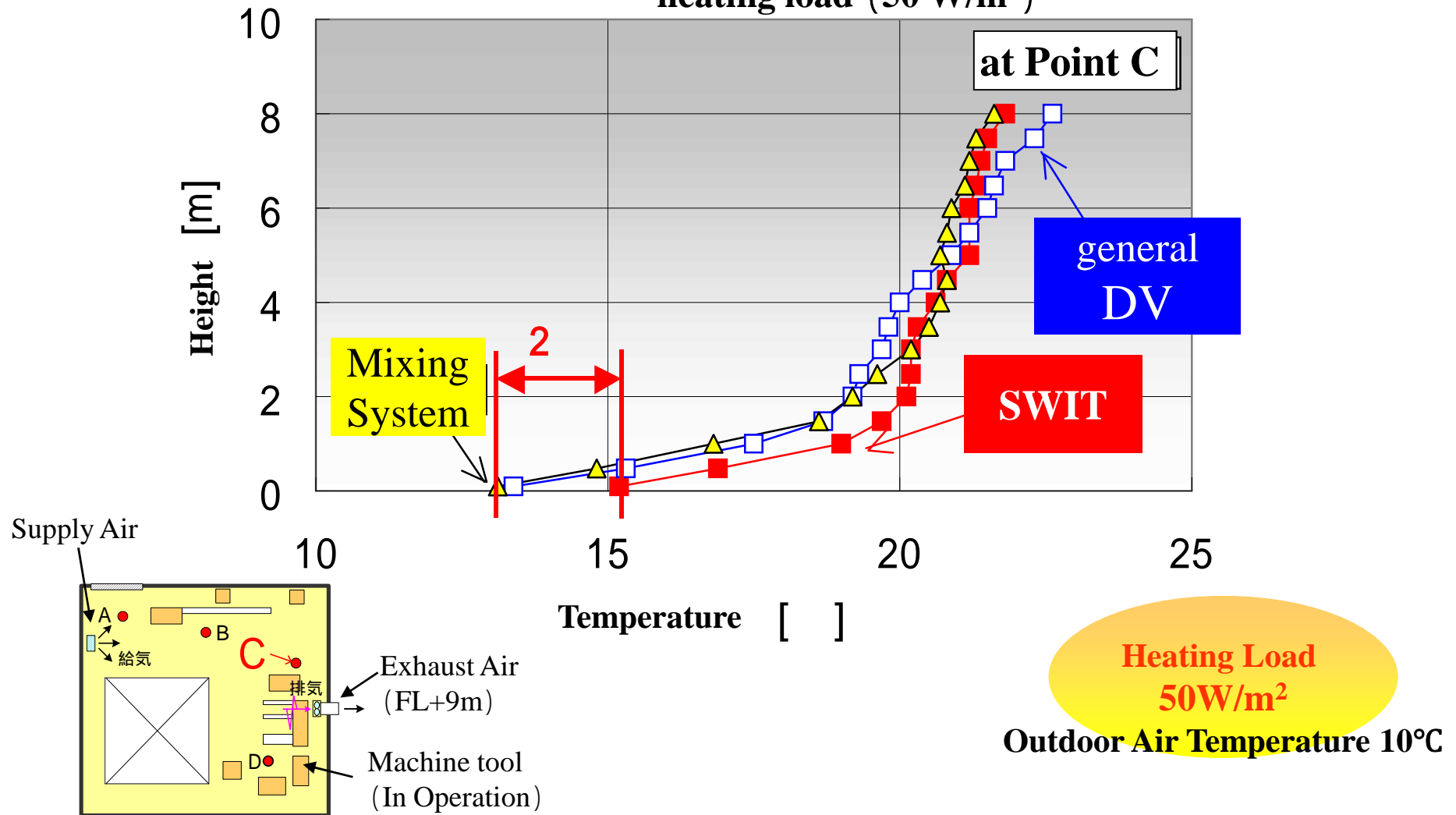
## Merit of SWIT

# Vertical Profile of Temperature at Heating

It verified that SWIT was most comfortable than other systems by field Measurement  
comparison in same conditions: supply air temperature (30 °C)

supply air volume (21 m<sup>3</sup>/h/m<sup>2</sup>)

heating load (50 W/m<sup>2</sup>)



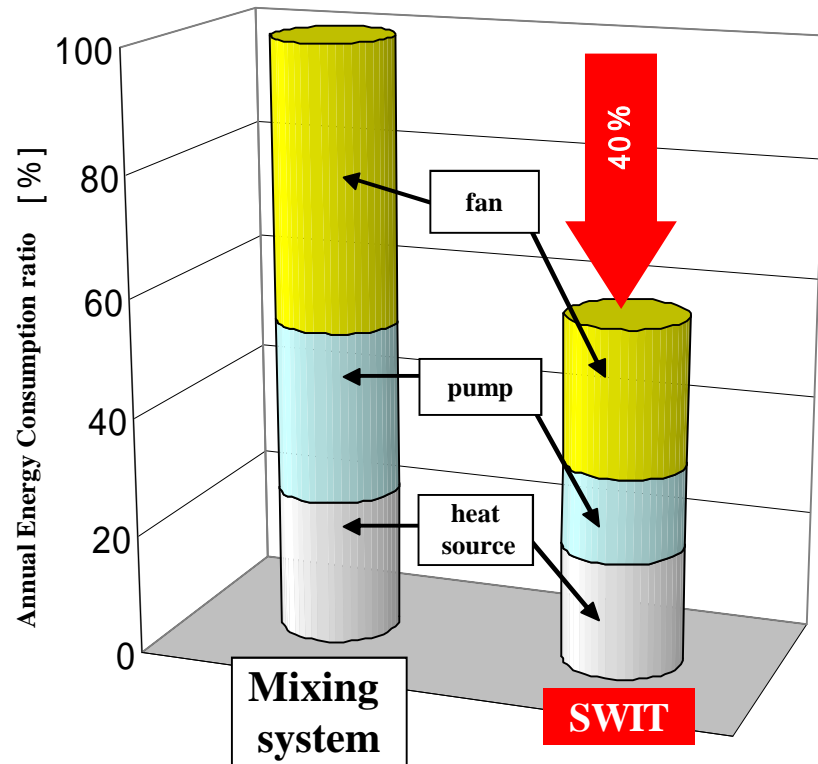
Machine work building : 200m<sup>2</sup> × 10m<sup>H</sup>

## Merit of SWIT

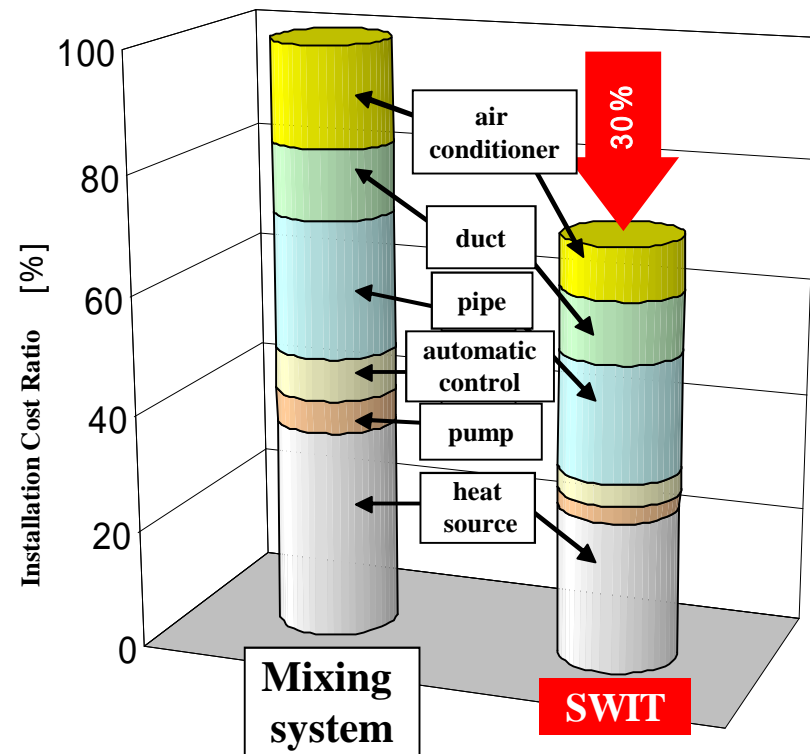
# Reduction of Annual Energy Consumption and Installation Cost

SWIT can reduce annual energy consumption and installation cost.

### Annual Energy Consumption



### Installation Cost



Calculate Conditions

Cooling Load 100W/m<sup>2</sup> , Floor Area 20,000m<sup>2</sup> , Outside Temp. Tokyo



# Users of SWIT



printing factory



training room



assembly plant



gymnasium

Organic Solvents

heat

Under operation  
172,000 m<sup>2</sup>

saving energy

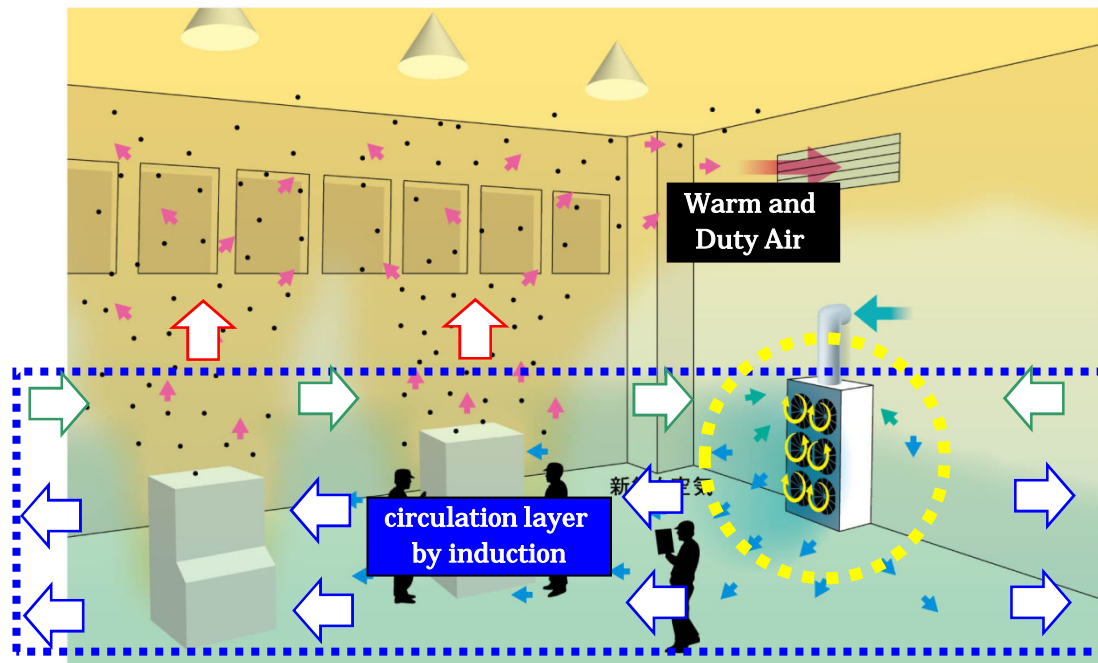
Contribution to improvements  
of warm temperature  
environment and air quality

## References

# Increase The Amount of Induction Air near The Supply Air Unit

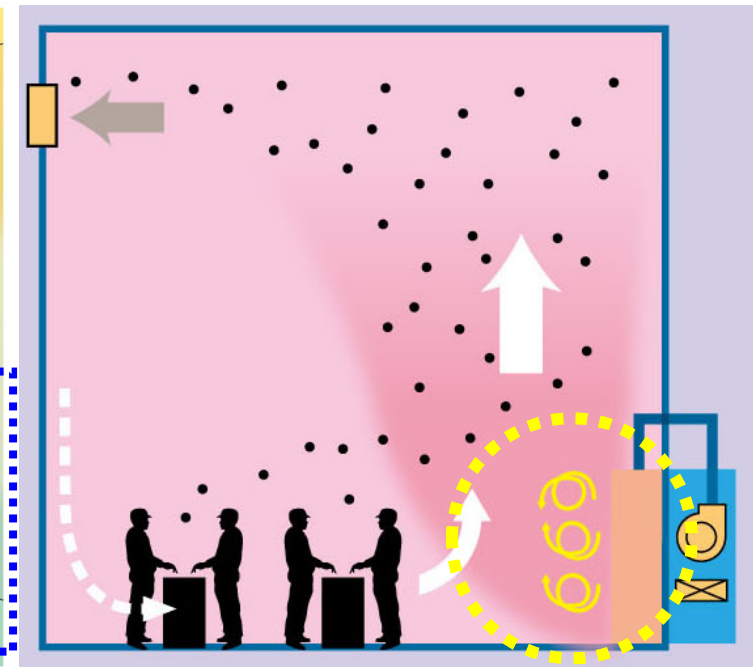
It solve a problem by effect of induction and natural convection

## Cooling



Air in occupied zone is moved slowly.  
Warm and duty air is lifted up from  
occupied zone.

## Heating

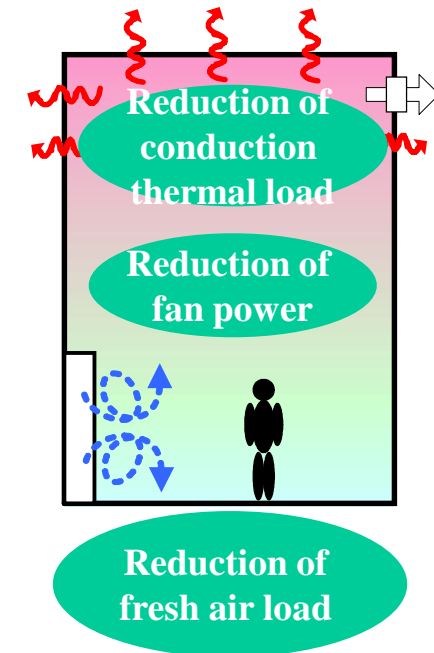
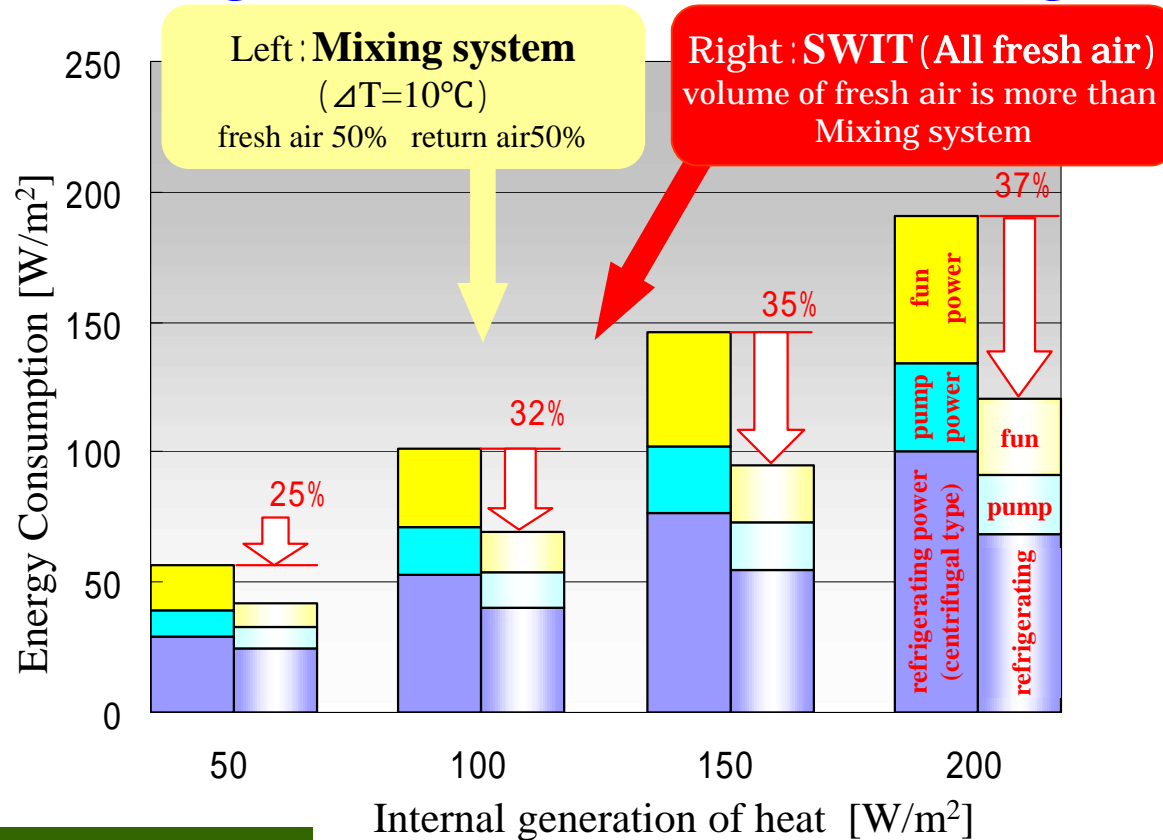


Cold air is removed  
from occupied zone.

## Merits of SWIT

# Reduction of Energy Consumption at Maximum Cooling Load

**SWIT can reduce energy consumption of room with large internal generation of heat and large fresh air load at maximum cooling load .**



## Calculate Conditions

Outside Tokyo TAC5.0%  
 33.4 18.7 g/kg(DA)  
 refrigerating efficiency COP=4.5  
 fan efficiency =0.5  
 fan total pressure  $P_T=800\text{Pa}$   
 pump efficiency =0.6

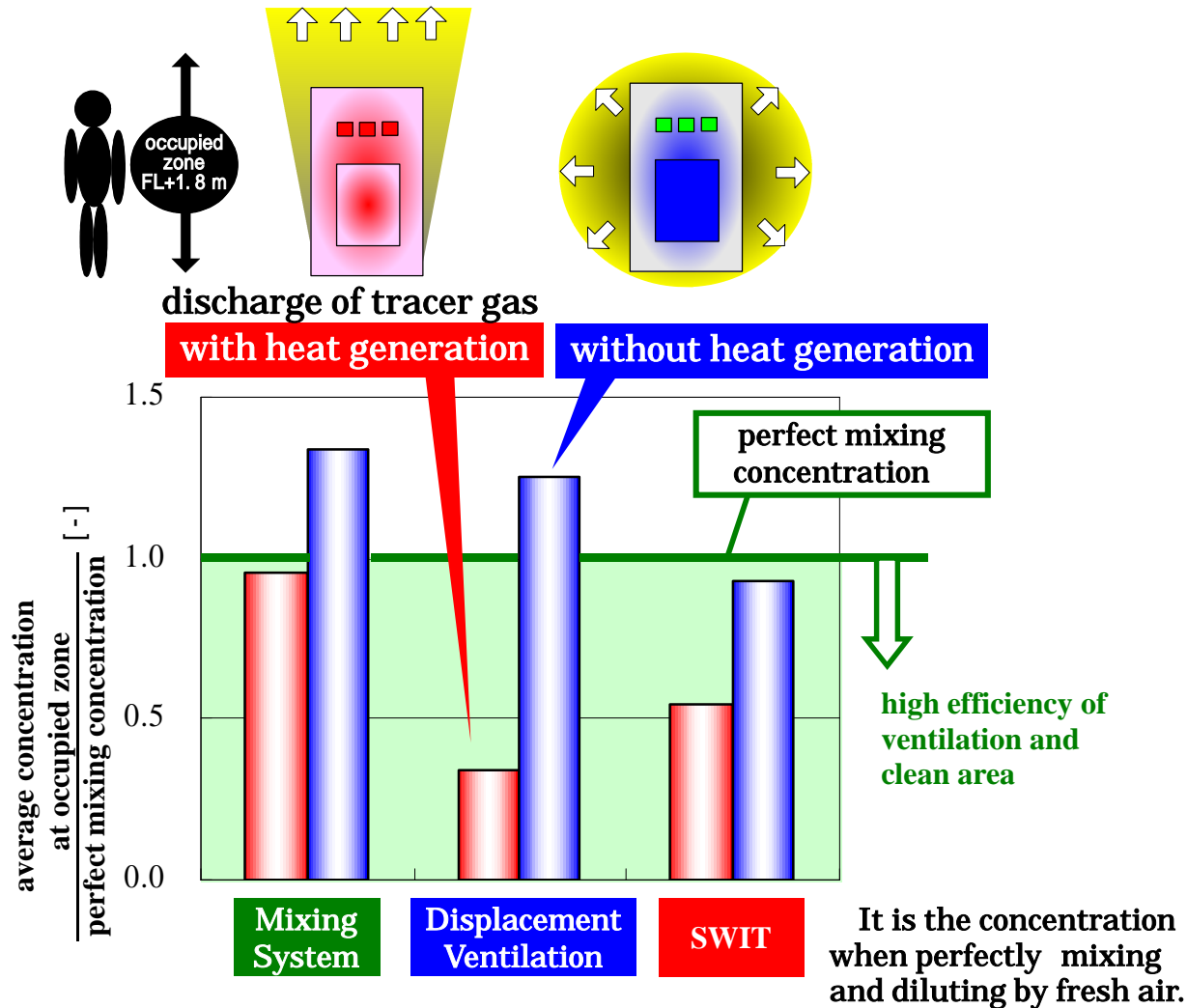
pump head  
 primary chilled water  $H=250\text{kPa}$   
 secondary chilled water  $H=500\text{kPa}$   
 cooling water  $H=200\text{kPa}$   
 vertical temperature gradient under 3 /m  
 outlet face velocity of unit 0.9m/s

It's assumed the factory with  
 20,000 $\text{m}^2$  floor area

## Merits of SWIT

# Improvement in Ventilation Efficiency

SWIT can dilute contaminants efficiently and keep at clean environment.



Ventilation efficiency comparison in case the generating point of contaminants differ.



SWIT can dilute air at occupied zone with fresh air.



It is difficult to dilute, since only the air near the floor move.

# Air flow Pattern of Displacement Ventilation System



Mixing System

Displacement  
Ventilation System (DV)